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Managing Water in the West

Setting the Stage – New Mexico's Water Resources

Congresswoman Michelle Lujan Grisham's

Water Innovation Summit

Tuesday, Oct. 14, 2014, UNM SUB

Dagmar Llewellyn,
Reclamation
Albuquerque Area
Office



U.S. Department of the Interior
Bureau of Reclamation

Why do we need water innovation?

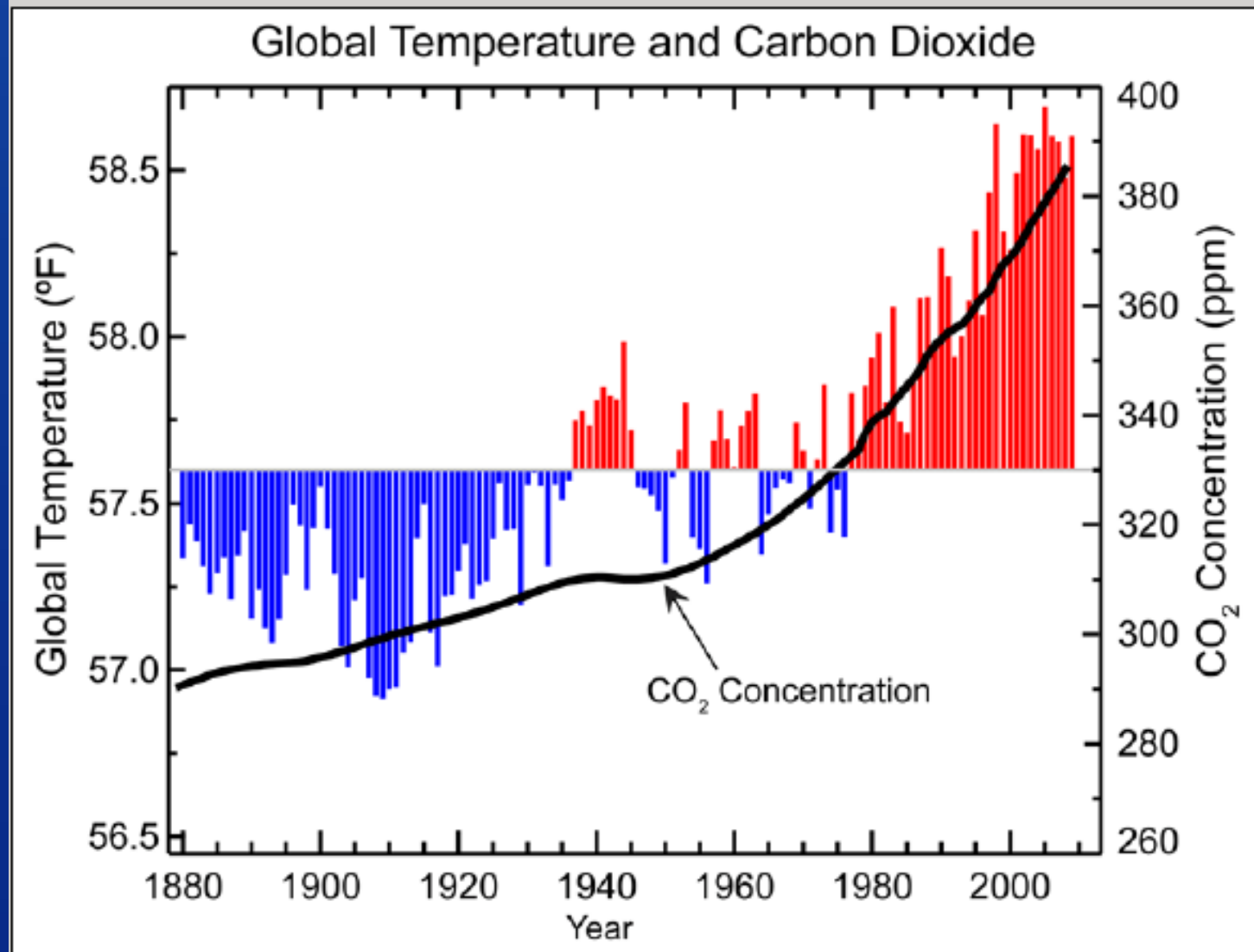
- Human development
- Population/Urban growth
- Forest management
- Agricultural and Grazing practices
- Groundwater mining
- **Climate change...**



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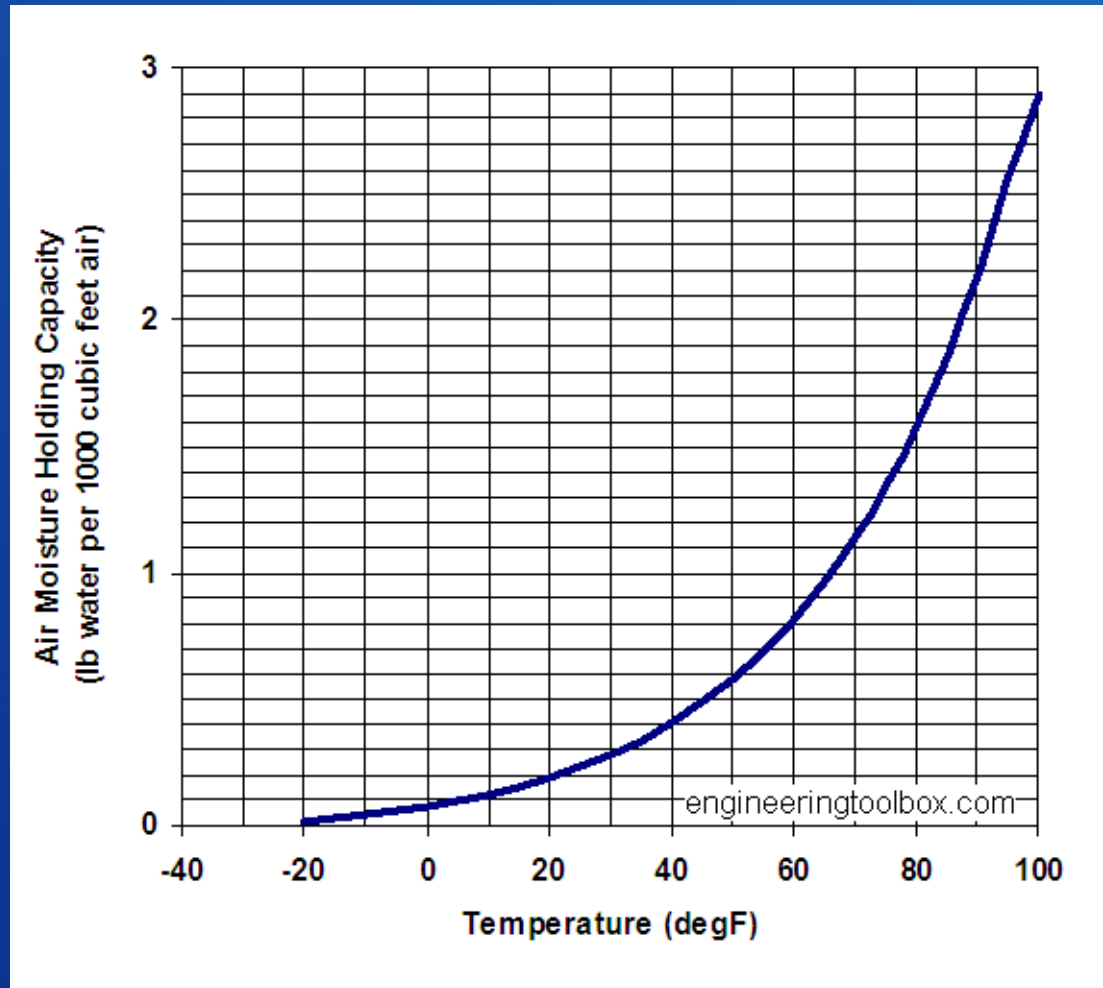
Rio Grande Basin (1971-2011)

- Average temperature increased by 0.7°F per decade
- Twice the global average



Exponential relationship between air temperature and water-holding capacity

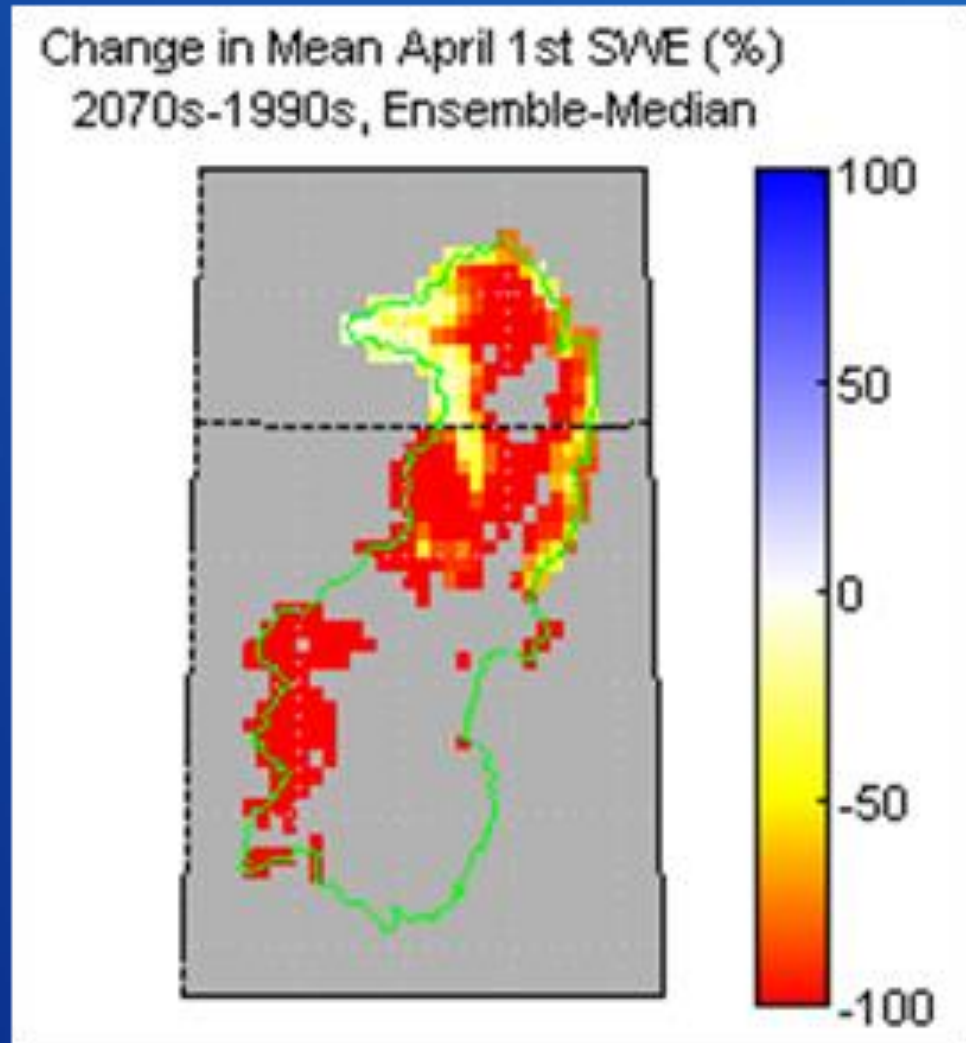
At higher temperatures, small change can lead to significant increases in water demand.



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Future Climate: Basin-Distributed Snow (2070s):

Warmer
temperatures
mean more
precipitation falls
as rain rather
than snow, and
the snow we do
get melts off
faster



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Projected Increases in Hydrologic Variability



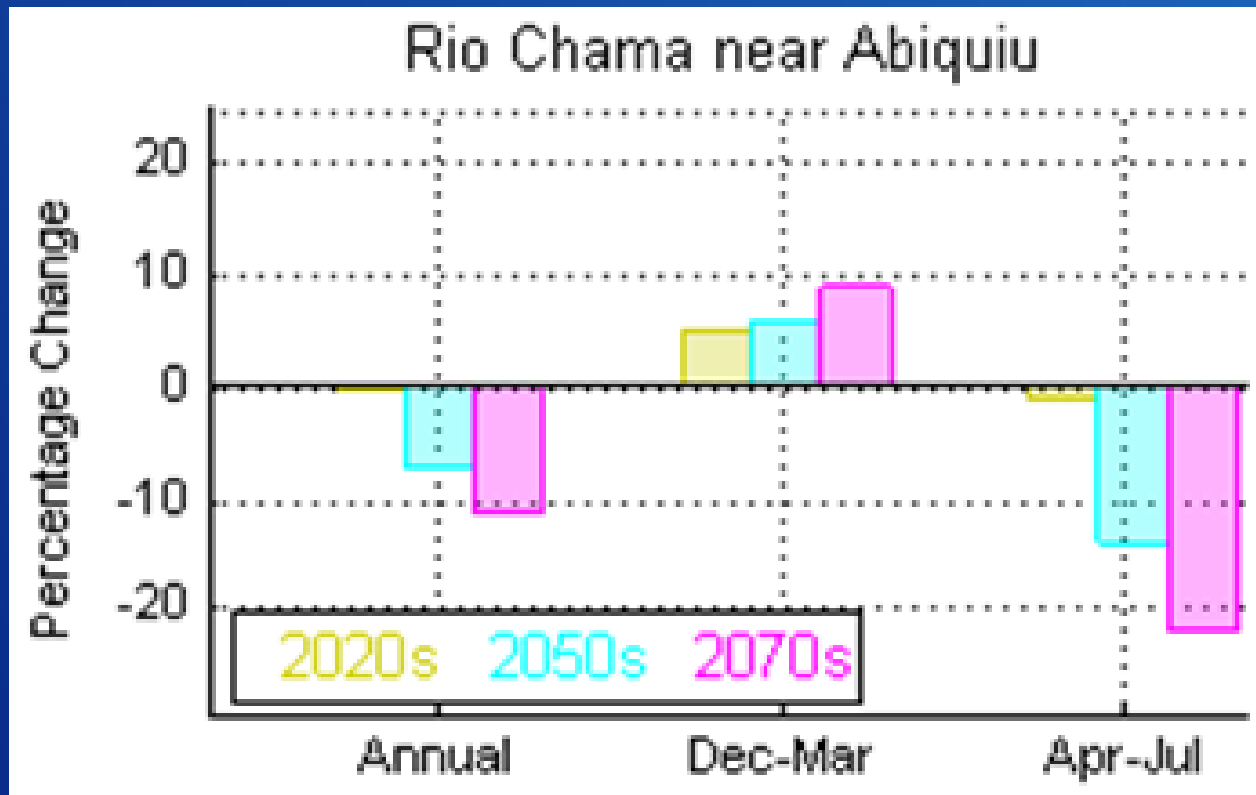
More energy in the atmosphere leads to more extreme events

More drought,
More flood...



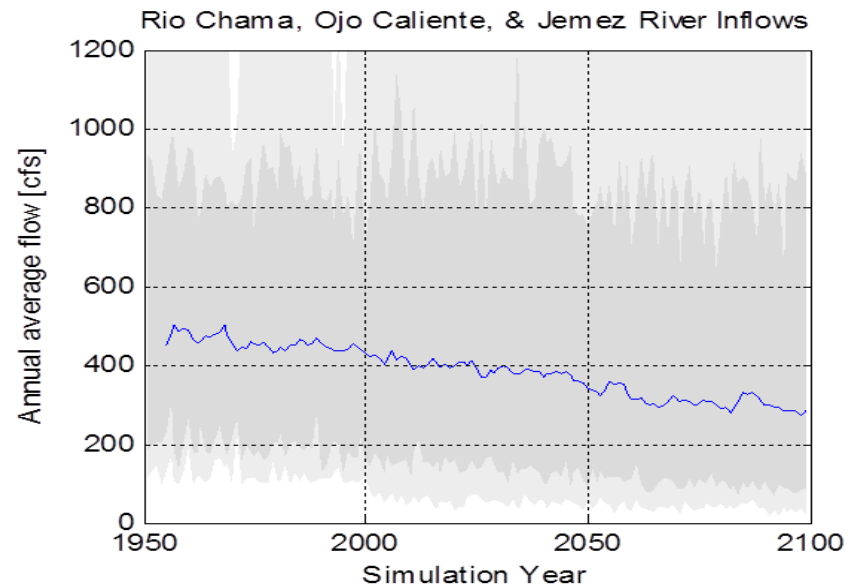
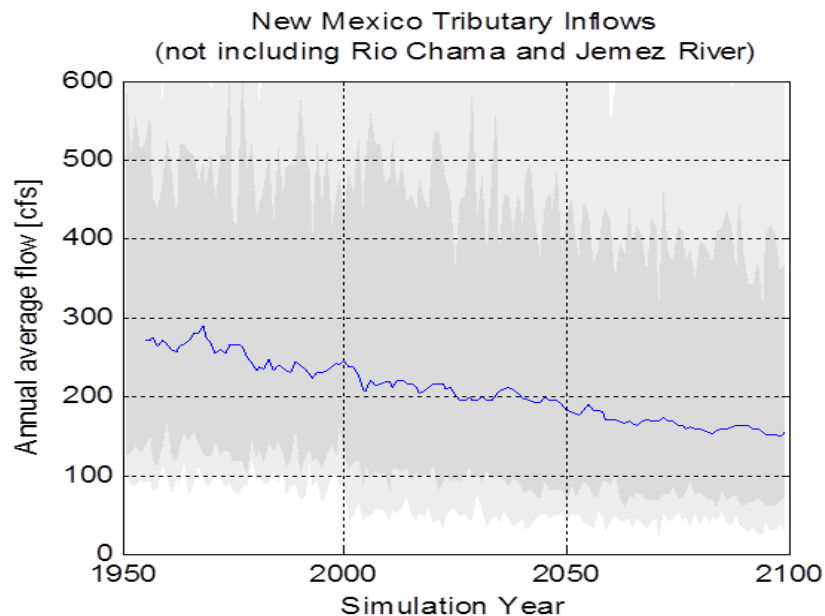
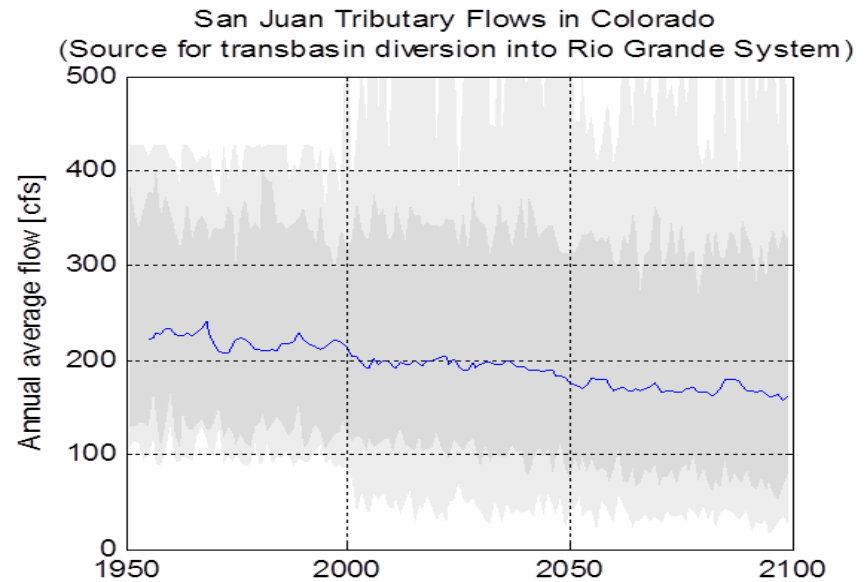
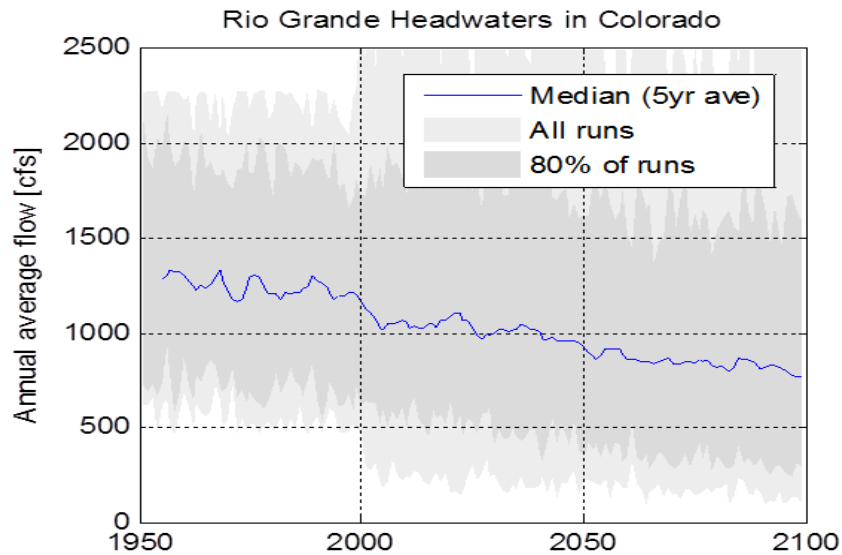
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Projected Impacts to Flow Timing

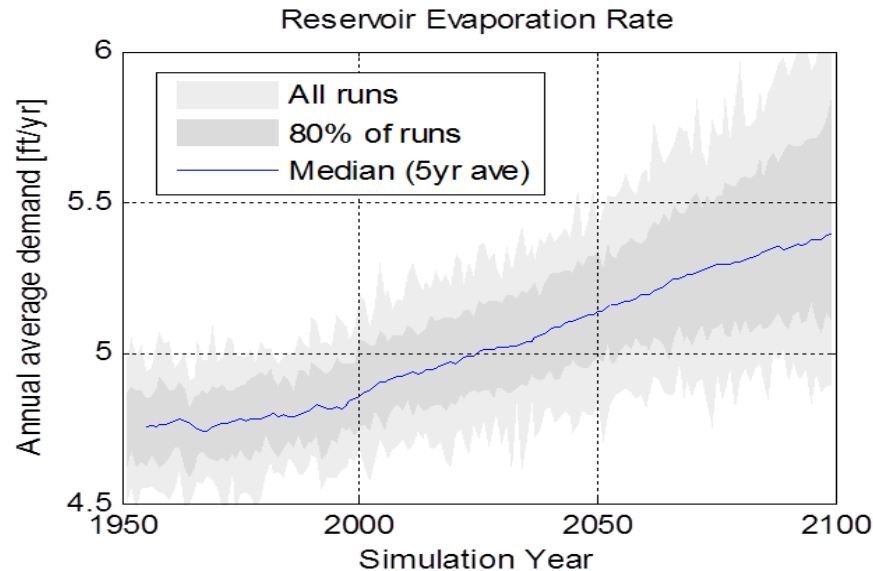
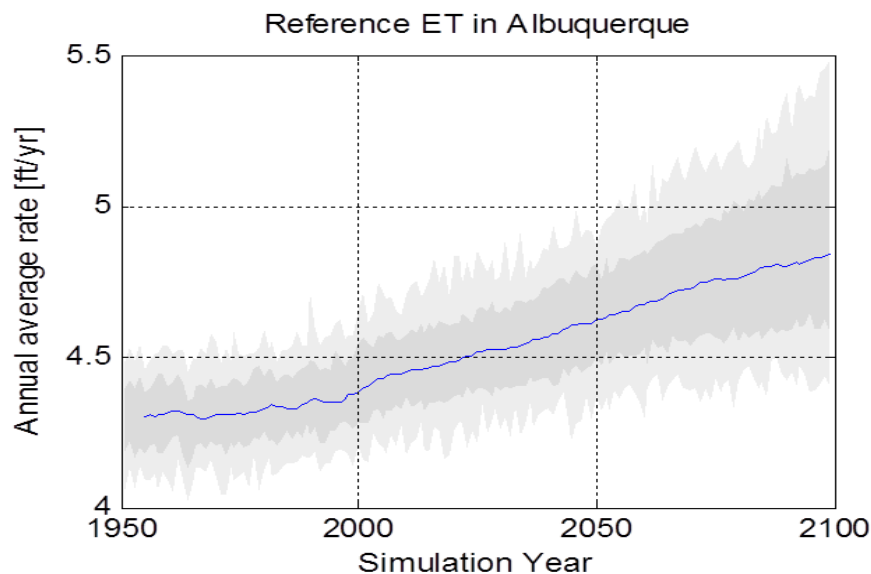
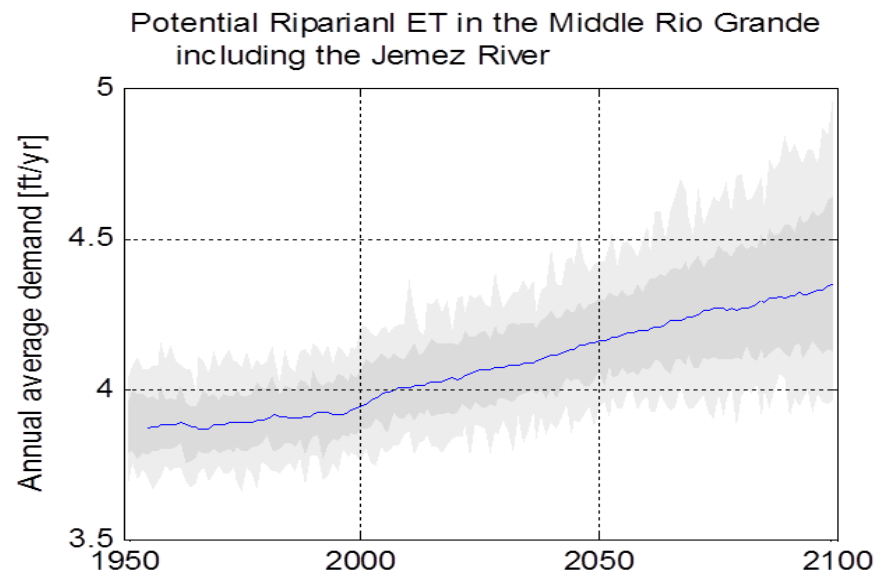
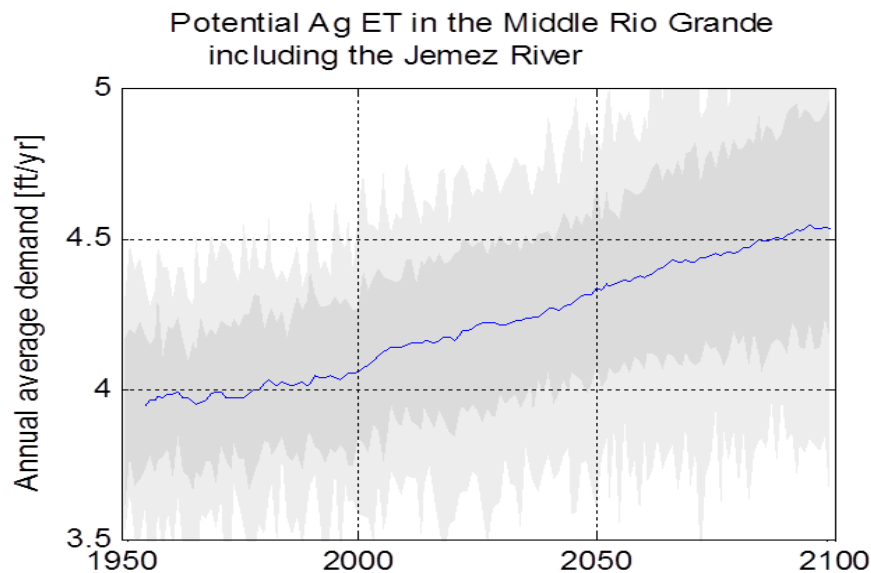


- Decreased annual runoff throughout basin
- Some regions have increased cool season runoff and reduced warm season runoff

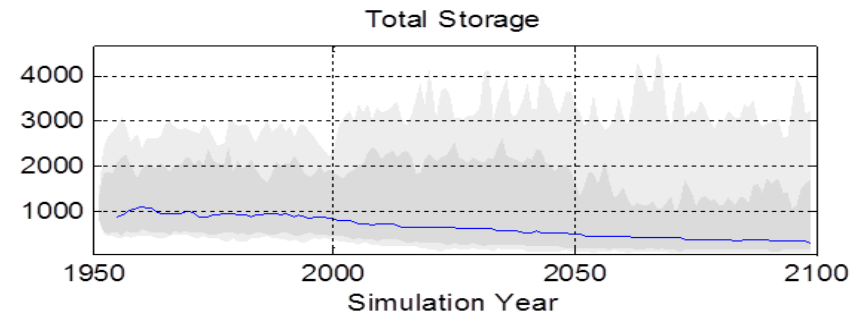
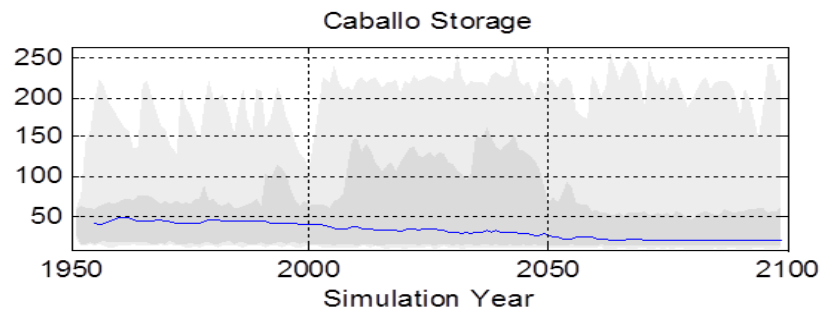
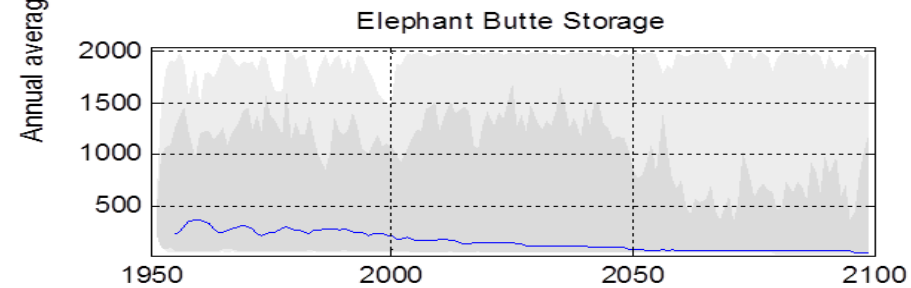
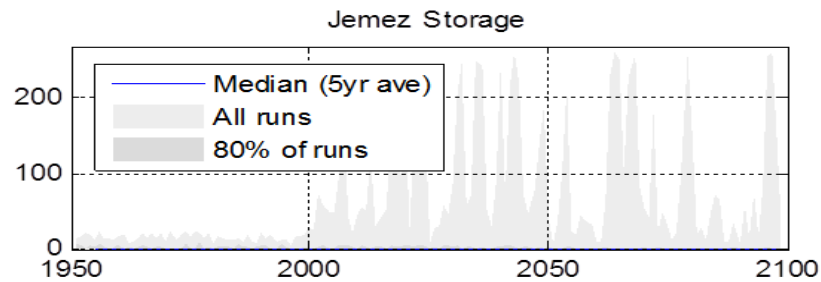
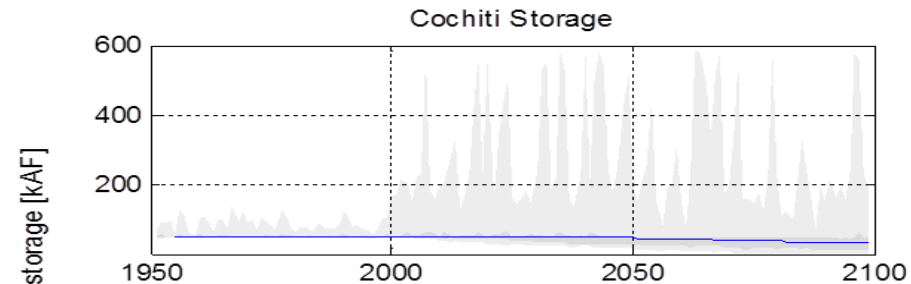
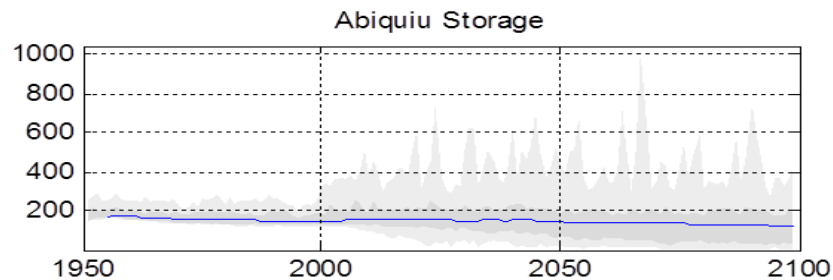
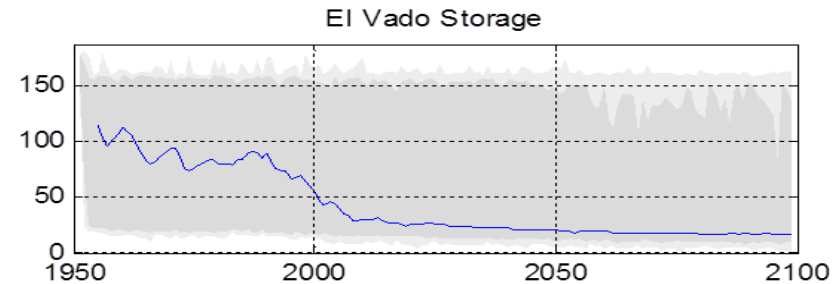
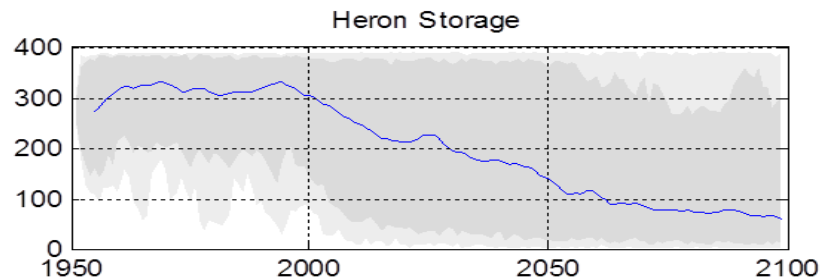
Models Project Reduced System Inflows



Models Project Increases in Demand: Agricultural, Riparian, and Reservoir Evaporation



Models Project Decreases in Reservoir Supply



Water Storage Trade-offs

- Our reservoirs are located and designed to capture snowmelt runoff – which is projected to decline.
- .Variability and the occurrence of extreme events is projected to increase, which would increase the flood-control storage space needed.
- So it will be tempting to fill our empty reservoirs, but it may put us at risk to do so.
- Additional storage options will be needed to take advantage of summertime monsoonal flows.

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Groundwater

- Cascade of primary impacts on groundwater*
 - Large increase in evaporation losses from shallow groundwater
 - Increases in water use by plants (transpiration)
 - Decrease in soil-water content
 - Decrease in water infiltration below the root zone
 - Reduced groundwater recharge
- Secondary impacts – increased groundwater pumping when surface-water supplies are low.

**Peggy Johnson, Utton Center
Conference, Oct. 9 2014*

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Feedbacks

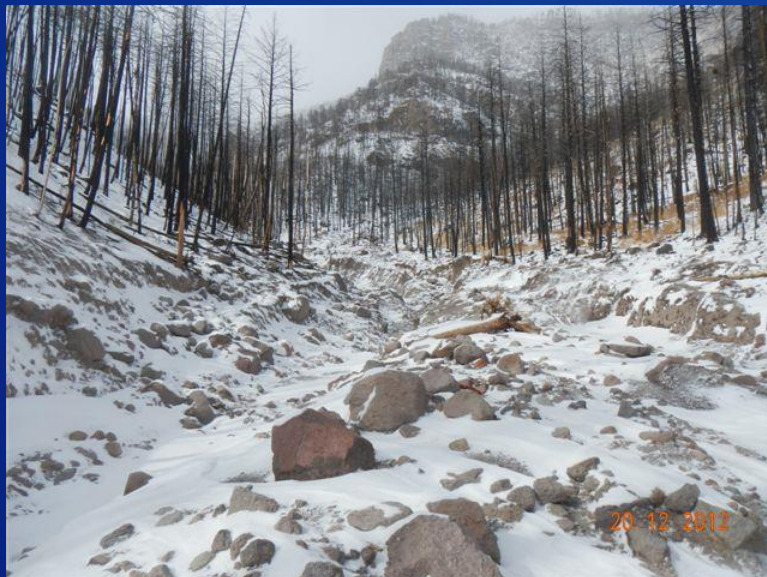
Example from the San Luis Valley last winter....

- Snow falls
- Albedo increases
- More solar energy is reflected
- Temperature decreases
- More precipitation falls as snow



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Cascading Impacts



**Las
Conchas
and its
aftermath**

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Overall Changes Projected in Southwestern Hydrology

- The water supply that we have long relied on, from mountain snowpacks and storage in upstream reservoirs, is projected to decline by approximately 1/3 over the century.
- Monsoonal changes are uncertain, but intensity may increase.
- Our water supply will be more variable and unpredictable.
- There will be changes to where and when water will be available.
- Feedbacks and cascading impacts pose additional uncertainty.
- All of these changes are confounded by all of the other things that humans do.

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Basin Study Program

WWCRA

Baseline Assessment
of risks and impacts

Determine
Imbalances in Water
Supply & Demand

SECURE Guidance
Development

Basin Studies

Stakeholder
engagement

Develop adaptation
strategies

SECURE

SECURE Studies

SECURE Feasibility
Studies

Specified Areas

Water Delivery
Hydropower
Recreation at BOR facilities
Fish & Wildlife Habitat
Endangered, Threatened or
Candidate Species
Water Quality
Flow & Water dependent
ecological resiliency
Flood control management

Understand
risks in a
landscape
context

Applied
science tools

Supporting
resource
managers

Landscape Conservation
Cooperatives

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